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ADHESIVE PANELS AS A CONTROL METHOD OF THE COMMON CLEG HAEMATOPOTA PLUVIALIS L. (DIPTERA: TABANIDAE)

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SUMMARY: A successful method is described of reducing the numbers of the horsefly *Haematopota pluvialis* on an Army training area, using coloured panels coated with a non-drying adhesive.

Introduction

A number of Army training areas in the United Kingdom and Germany are heavily infested with the blood-sucking horsefly *Haematopota pluvialis*. The high incidence of this fly on training areas has been shown to be due to the fact that it will reproduce prolifically in the undisturbed old-field pasture which many training areas largely comprise. These are rarely or never ploughed, nor are they treated with chemical fertilisers[1]. The fly will develop through its larval and pupal stages in this environment emerging as an adult in mid to late June. The female requires a blood-meal before laying viable eggs, and while horses, cattle and sheep are commonly attacked, man also acts as a favoured host. The flight season covers a period of six to eight weeks, with few adults remaining after mid August, although this period will vary slightly from year to year. Winter is always passed in the larval stage.

The Royal Armoured Corps Range at Castlemartin near Pembroke is heavily infested with *Haematopota pluvialis*, biting rates of over 140 an hour having been recorded. It was on this training area that an attempt was made to control the fly.

Trapping method

Several designs of trap which had proved successful in capturing other species of blood-sucking fly were tested, but none were of any use against *Haematopota pluvialis*. The effect of various shapes of decoy was investigated by hanging individually a sphere, circle, cube and cylinder below the trap (Figure 1). None of these encouraged the fly to enter the trap. Carbon-dioxide dispensed from a cylinder, or from solid CO_2 in a bucket of water below the trap attracted more flies, but not enough to warrant the expense of supplying the gas over long periods.

A number of chance observations led to the eventual successful technique. It was noted that *Haematopota pluvialis* followed a moving landrover, landing on it when it slowed down or stopped, and gathering particularly on the warmer

parts of the engine and bodywork. The flies preferred to land on a dark blanket draped over the canopy, rather than on the canvas itself. It was seen that flies landed on dark clothing in far greater numbers than on lighter clothing (Figure 2), and that they were not at all attracted to yellow. These observations confirm the accepted attraction factors for many blood-sucking insects, namely movement, heat, the presence of carbon-dioxide, texture, shape and colour. The last of these factors was investigated further to determine whether it was the difference of colour pigment, or simply the amount of light reflected which affected the fly.

Two sets of two foot square plaster-board panels were prepared and painted to exact standards of red, yellow, green, blue, white and black, by the Materials Quality Assurance Directorate (MQAD). Neutral grey panels with similar reflectance values to each of the colours were also prepared (Table I), the value relating to a standard (100 per cent) of magnesium oxide.

Table I
Reflectance values and British Standard specification of panels

Panel	Reflectance value (percentage)	British Standard specification
Black	7	00—E—53
Dark-grey	14	18—B—25
Blue	15	18—E—53
Red	38	04—E—53
Mid-grey	41	00—A—05
Green	42	12—E—53
Yellow	75	10—E—53
Light-grey	75	00—A—01
White	98	00—E—55

Note: Since the reflectance of red and green were so close, only one grey was matched.

The panels were set out on stakes in an area heavily infested with *Haematopota pluvialis*, one set in an open field (Figure 3) and the other against a hedgerow (Figure 4) so that the influence of environmental background could be assessed. The panels were arranged in a line running east to west to ensure maximum diurnal illumination, each panel being two feet six inches above the ground and with a space of two feet between each. The panels were then coated with a non-drying adhesive based on a solution of polyisobutylene in petroleum ether prepared by MQAD, applied as a thin coat with a paint-brush.

Results

The number of flies on each panel was counted at 24 hour intervals for 10 days and the flies removed.

Table II shows the number of flies caught on the two sets of panels. It was apparent that the darker colours were more attractive to the flies, but this was not because of the amount of light reflected by them. Had the fly been attracted simply by the amount of light reflected or absorbed by the panel, it would have been expected that the numbers on each pair or trio of colour/grey panels would

Fig. 1

Fig. 2

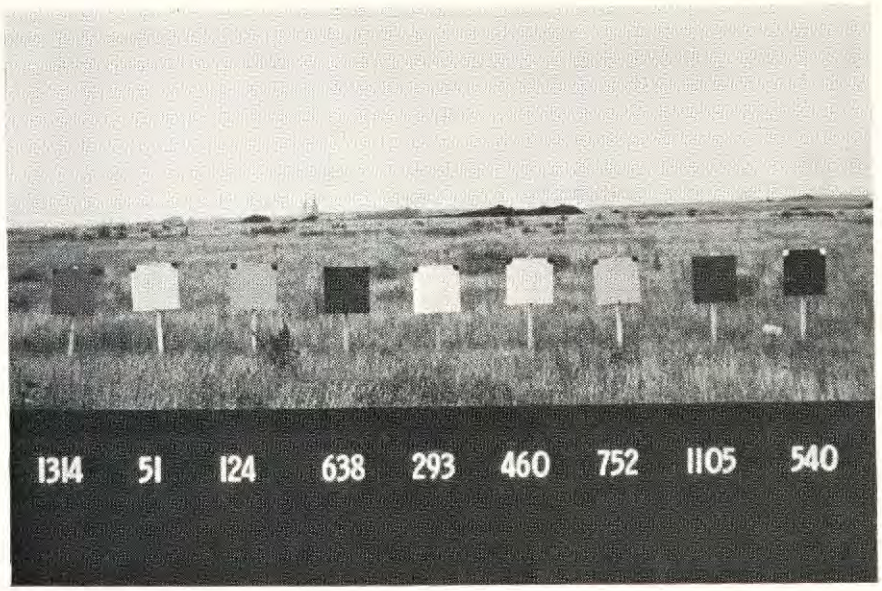

Fig. 3

Fig. 4

be similar. Table II shows that this is not the case, thus it must be assumed that it is the colour itself which influences the fly.

An interesting anomaly occurred with the red panel on the two sites which took the highest catch in the open field, but was far less successful against the hedgerow. An explanation of this is that since the reflectance values of red and

Table II
Haematopota pluvialis caught on each panel (percentage of total for each site in brackets)

Panel	Open field		Hedgerow		Total
Black	540	(10.23)	401	(8.33)	941
Dark-grey	1105	(20.94)	1457	(30.28)	2562
Blue	638	(12.09)	671	(13.94)	1309
Red	1314	(24.90)	479	(9.95)	1793
Mid-grey	752	(14.25)	733	(15.23)	1485
Green	124	(2.35)	133	(2.35)	237
Yellow	51	(0.97)	74	(1.54)	125
Light-grey	460	(8.72)	518	(10.76)	978
White	293	(5.55)	366	(7.61)	659
Total	5277		4812		10089

green are almost identical, the red panel may not have contrasted sufficiently with the green background of the hedgerow for the fly to appreciate it. As a trapping method it was realised that panels would sometimes have to be set against non-contrasting backgrounds, so on overall results the dark-grey panel was selected for further trials.

Sets of three dark-grey panels facing east, south and west respectively were set up on ten different sites on the Range area and coated with adhesive (Figure 5). The flies caught on each panel were counted and removed daily for a period of four weeks in June and July, the panels being cleaned and the adhesive re-applied when necessary. Over this period some 24,700 *Haematopota pluvialis* were

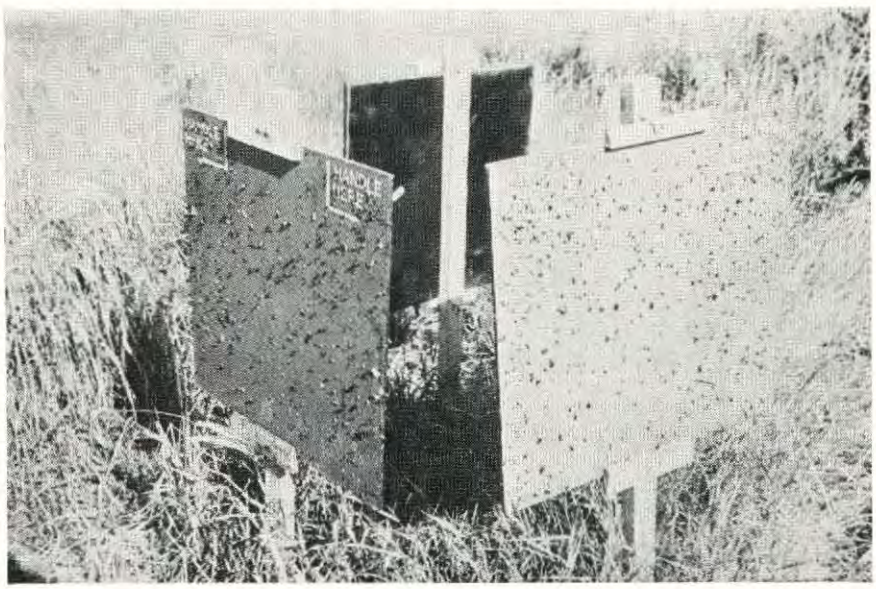

Fig. 5

destroyed. The trial was repeated the same period the following year when the weather was less sunny and more windy, and over 17,000 flies were trapped.

Discussion and conclusions

In the natural environment the ratio of male to female *Haematopota pluvialis* is about 1:9. However the vast majority of flies caught on the panels were female, the few males captured probably being attracted by the presence of the females.

The results presented show that this method is undoubtedly successful in reducing the numbers of female *Haematopota pluvialis,* which are attracted to the panels instead of biting Man. Since each fly caught could have laid about 100 eggs, many of which would develop into adults by the following summer, the number of adult females destroyed would seem to be a significant loss to the total population, particularly if this method of trapping were maintained for several consecutive years.

This work has shown that even closely related species of insect are very individual in their habits and behaviour. *Haematopota pluvialis* does not breed in the same terrain as the majority of Tabanidae[1] and well tried techniques for trapping pest species of blood-sucking fly were tried with little success for *Haematopota pluvialis.*

It is assumed that female *Haematopota pluvialis* require a blood-meal before ovipositing, and the situation on the Castlemartin training area is worth comment. Apart from numbers of incidental or unlikely hosts such as foxes, rabbits and birds, the only favoured host present during the flight season on the area of some 6,000 acres is Man; cattle and sheep are only present during the winter and early spring when no adult clegs are alive. On parts of the training area the density of larval stages is as high as one per square foot. Thus the adult female flies, having emerged and mated, appear to fly several miles to obtain a blood-meal from sheep and cattle in the farmland bordering the training area, and return to lay their eggs in the undisturbed old-field pasture. It is no wonder that soldiers, range staff and entomologists actually on the training area provide such a welcome and accessible blood-meal for the female cleg!

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REFERENCE

1. Burgess, N R H, Shuttleworth, A E and Chetwyn, K N (1978). The immature stages of the common cleg *Haematopota pluvialis* L (Diptera: Tabanidae) in the field and in the laboratory. *Journal of the Royal Army Medical Corps* **124,** 27-30.